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Future of sustainable eating? Examining the potential for expanding bean eating in a meat-eating culture

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ABSTRACT

A transition towards more sustainable food consumption requires changes in everyday eating patterns, particularly a substitution of animal protein with plant-based protein sources. However, in many European countries plant protein consumption is low compared to meat consumption. The article explores plant protein consumption frequencies, future intentions to increase bean consumption, and the associations of frequent bean eating with socioeconomic factors and bean-related meanings, material issues and competence. A population web-based survey was conducted in 2013 among 15–64-year-old Finns (n = 1048). The results showed that beans and soy-based plant proteins were infrequently consumed. A fifth of the respondents intended to increase their bean consumption in the future, intention being the greatest among those who already included beans in their diets. Frequent bean consumption was most likely among persons aged 25–34, living around the capital district, with education higher than comprehensive or vocational school, and who were vegetarian. Perceiving beans as culturally acceptable and good-tasting, and having competence in preparing bean meals were positively associated with the frequent eating of beans. The results suggest that for plant proteins to replace meat, new meanings and competences related to preparing and eating pulse-based dishes are needed. Based on our results, we build alternative future scenarios for plant protein consumption and the related requirements for changes. Several actor groups, such as NGOs, politicians, celebrity chefs and teachers of home economics have a central role in the developments.

1. Introduction

1.1. Background—current and future consumption of proteins in western food cultures

In Western food cultures and meals, meat holds a central place (Fiddes, 1991). Its consumption has steadily increased during the past decades (Anonymous, 2013; Vinnari & Tapio, 2009), whereas that of plant proteins has been stable (de Boer, Helms, & Aiking, 2006). Although in Western Europe the consumption of meat is not expected to increase much (de Boer et al., 2006), it has been forecasted that the worldwide demand for animal products will grow significantly in the coming decades, and that the global production of meat will more than double between 1999 and 2050 (Steinfeld et al., 2006).

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In Finland meat consumption has increased ever since the 1950s, and has now reached 77.5 kg per capita per year (Anonymous, 2013). Meat holds a central place in Finnish meals and food purchases (Vinnari, Mustonen, & Räsänen, 2010), as is the case in other Nordic countries, too. In the late 1990s around 60% of hot meals eaten by Finns included a meat "centre", compared to the 8–13% of hot meals with a vegetable centre (Mäkelä, Kjaernes, & Pipping Ekström, 2001). Since meat has a high status in Western cultures, social and cultural forces opposing a change from meat to plant proteins are strong (de Boer, 2006a).

Whereas tofu was unfamiliar in Western diets until the mid-1970s (Shurtleff & Aoyagi, 2013), beans have been a part of European diets for centuries (Cubero, 2011). On the whole, however, human consumption of pulses in European Union countries has been low compared to countries in such as Burundi, India, Nicaragua and Lebanon, where pulses are a central part of the diet (Schneider, 2002).

In Finland, broad beans (or fava beans) have been cultivated since the 15th century and they were commonly used in dishes such as bean soup. In the 1960s and 1970s the cultivation nearly ended due to, e.g., the late maturing of the imported varieties in Finnish farming conditions and the low price of imported soybean protein (Stoddard & Hämäläinen, 2011). Apart from broad beans, other beans or lentils have not been a part of the traditional Finnish cuisine or mainstream food culture either. Recently, however, public and media interest in cuisines and dishes from other parts of the world have probably somewhat affected the consumption of plant proteins. In addition to broad beans, peas have been cultivated and eaten in Finland for centuries and they are still currently used as a side dish or as an ingredient in pea soup, which is an old and traditional dish.

For some time already there has been a growing concern about the negative impact of the herding, slaughtering and eating of animals on the environment, animal welfare and human health. Studies have shown that substituting plant proteins for meat is beneficial both from an environmental (Carlsson-Kanyama & González, 2009; Godfray et al., 2010; Pimentel & Pimentel, 2003; Virtanen et al., 2011) and health perspective (Nordic Nutrition Recommendations, 2014; World Cancer Research Fund, 2013). For example, vegetable-based meals have lower CO_2 emissions compared to meat-based meals (Virtanen et al., 2011), and high consumption of red meat and processed meat has been associated with cancer risk, whereas pulses have several positive health effects (Nordic Nutrition Recommendations, 2014; World Cancer Research Fund, 2013).

The growing concern for the negative consequences of meat consumption has not thus far been reflected in the proportion of vegetarians, which has remained steadily at 2–4% among Finns since the mid-1980s (Helldan, Helakorpi, Virtanen, & Uutela, 2013; Vinnari, Montonen, Härkänen, & Männistö, 2008; Paturi, Tapanainen, Reinivuo, & Pietiläinen, 2008). Moreover, in 2007 only 2–4% of the daily intake of protein was gained from vegetables and vegetable dishes, compared to 29–34% from meat dishes, 25% from cereal and bakery products, and 23% from milk and dairy products (Paturi et al., 2008).

A study on expert views of future meat consumption in Finland suggested potential factors that may reduce meat consumption in the future. These included, e.g., the increasing number of vegetarians, the positive image development and the increasing acceptance of meat alternatives, the better knowledge about preparing vegetarian meals, the development of novel protein sources, the decreasing price of alternatives to meat products, and the decreasing meaning of meat as a status food and increasing importance of health issues to humans (Vinnari, 2008). In another study, future scenarios of consumption for the year 2030 included an eco-efficiency scenario where meat is very expensive due to a limited quantity of production, and consequently, it is often replaced by protein substitutes (Vinnari & Tapio, 2009). In a sufficiency scenario, the balancing between physical needs, hedonist pleasure, and animal welfare, has led to meat being consumed only at special occasions.

1.2. Cultural and socio-economic factors influencing the consumption of plant protein

In order to understand current and future consumption of proteins, it is vital to understand the associations of consumption and other factors, such as attitudes and socioeconomic background. Several studies have investigated the reasons to eat or not to eat plant proteins. Among Canadians, tastiness and healthiness were the most frequently mentioned reasons for eating pulses, whereas long preparation time and inconvenience, not knowing how to cook pulse dishes and not liking pulses, were the most frequently mentioned reasons for not eating pulses (IPSOS, 2010). The U.S. study showed that the major barrier for soy consumption was lack of knowledge on how to use it, and nearly a half of the respondents considered that soy products were not readily available and that their flavour or texture was not appealing (Wenrich & Cason, 2004). A qualitative study revealed that taste preferences, cost and convenience factors were significant barriers to soy consumption, and that the health benefits of soy were not enough to inspire changes in food choices (Schyver & Smith, 2005). The greatest barrier to soy consumption was its largely unfavourable image, for example, tofu was described as "yucky" or "weird" and soy products were considered as a substitute for animal protein or dairy products that vegetarians or those with allergies were forced to eat (Schyver & Smith, 2005). The cultural background of liking of soy is exemplified in a study comparing French and Vietnamese consumers, showing that in France soy was not seen as a pleasurable product, whereas is Vietnam it was a product of memories, emotion and pleasure (Tu, Husson, Sutan, Ha, & Valentin, 2012). A Finnish study focusing on the future of meat showed that both consumers and experts regarded laboratory grown artificial meat as very undesirable or improbable (Vinnari & Tapio, 2009).

Likewise barriers – lack of familiarity, food neophobia and a belief that meat substitutes lack sensory attractiveness – have been found among non-users of meat substitutes (Hoek et al., 2011). Moreover, heavy users of meat substitutes gave higher ratings for, e.g., ecological welfare and political values (Hoek et al., 2011).

Socioeconomic background and gender, too, have been shown to be associated with the consumption of plant proteins. In the UK and the Netherlands, users of meat-substitutes had a higher level of education than non-users. In the UK, there were more heavy users among women and younger age groups than among men or older age groups (Hoek et al., 2011). A Canadian study showed that pulse consumption increased with education and that "light" pulse users were generally older than non-consumers or heavy users (IPSOS, 2010). Moreover, studies have shown that women report more eating of other vegetable products, such as fruit and fiber-rich foods (Wardle et al., 2004).

1.3. Studying plant protein consumption as a practice

Most previous studies on determinants of plant protein consumption have either studied soy products (Schyver & Smith, 2005; Tu et al., 2012; Wenrich & Cason, 2004) or meat substitutes (Hoek et al., 2011; Schösler & Boer Boersema, 2012; Wardle et al., 2004), applied qualitative methods (Ioannou, 2009; Tu et al., 2012) or analysed only the associations of consumption and socioeconomic factors (Lucier, Lin, Allshouse, & Scott Kantor, 2000). Moreover, for futures studies, food in general and the evolving patterns of consumption is a complex issue *par excellence* that is thus far ill-studied (Hurley, 2008). Therefore, there is need for studies analysing plant protein consumption that would take into account not only socioeconomic factors, but intentions, competence and perceptions, too.

In the present study, one plant protein source was chosen for detailed analysis: dried/canned beans. They were chosen because culturally they are located between peas and green beans, which are typically eaten as a side dish for meat meals, and tofu and other soy products that are the most distant from mainstream Finnish food culture. Due to their very low consumption, tofu and other soy products are not feasible for an analysis with general population data.

In this study, we apply a practice-theoretical perspective to investigating and interpreting plant protein consumption. Practice theories are increasingly used in social sciences in analysing the formation and distribution of new practices. According to Reckwitz (2002), practice is a routinised type of behaviour. According to Shove and Pantzar (2005), positive images, material equipment and the knowledge of how to use the materials together create a new practice. Practical knowledge, meaning and competence are themselves forged and reproduced in the process of doing (Shove et al., 2012). Moreover, technologies, conventions and conceptions of what is proper, normal, comfortable and pleasurable affect practices. For example, practices of cycling are affected by meanings, competences and the bicycle-related infrastructure (Shove et al., 2012). When a practice is increasingly carried out by a large enough number of people, it becomes normal and, consequently, enhances the process of even more people engaging in it.

Practice theory is a useful tool for exploring plant protein consumption as a practice and for discussing its changes in the future. For a routinised "bean-eating practice" to emerge in European meat eating cultures, several elements – including positive meanings, appropriate materials, and skills and competences – need to be in place (Shove, 2010).

Against this background, the aim of this article is to study the practice of eating plant proteins by focusing on a) plant protein consumption frequencies, b) intentions to increase bean consumption in the future and willingness to try new bean products and their associations with consumption, and c) the associations of frequent bean eating to socioeconomic factors and bean-related meanings, perceptions, competences and material factors. Furthermore, in the discussion, based on our results and previous literature, we build alternative future scenarios for plant protein consumption and the related requirements for changes in meanings, competences and materialities of plant proteins.

2. Material and methods

The study "Beans on Finnish dinner tables" is part of a larger project "Manufacturing of food products and food ingredients based on broad beans". The data were gathered between February 12 and February 27, 2013 with an online questionnaire with one reminder, directed to members of a consumer panel, representative of Finnish 15–64-year-old Internet users. In 2009, over 90% of the 15–44-year-olds and 81% of the 45–64-year-olds had Internet access at their homes (Official Statistics of Finland, 2009). Of the contacted consumers, 16% completed the questionnaire, yielding 1048 complete answers. As the internet panelists receive email invitations to questionnaires very frequently, it was expected that many ignore the invitations.

Women were slightly over-represented in the present data compared to population statistics (58% vs. 51%) (Official Statistics of Finland, 2015). The age and geographical distribution was very close to that of the general population. Comparison of education with population statistics was difficult because of different classifications used in the questionnaire and population statistics. However, it seems that those with at least Master level degree were over-represented in the data (21% vs. 10%). In total 6,8% of the respondents were vegetarians compared to a population survey showing that 4,2% of Finns were vegetarians in 2012 (Vinnari et al., 2008).

The questionnaire contained questions on sociodemographic background factors, frequency of eating plant protein sources, eating motives, intentions to increase the consumption of plant and animal proteins, and perceptions on the eating of beans, tofu and meat.

The following socioeconomic background factors are used in the present study: gender, age, geographical area, and education. Age is classified into 10-year classes. Geographical area was asked with 19 regions which were classified into four categories: Uusimaa (including the capital area and Eastern Uusimaa), Western Finland, Central and South-Eastern Finland, and Northern and North-Eastern Finland. Moreover, respondents were asked whether they follow some specific diet, followed by a list of diets, including "vegan diet" and "vegetarian diet". The respondents were asked to choose all diets they followed. In the analysis vegan and vegetarian diets were combined as "vegetarian".

The present study applies questions on the current *practice* of plant protein consumption, *meanings and images* of bean eating, *competence* of preparing bean meals and bean-related *material, bodily and infrastructure* components. Moreover, intentions as regards *future practices* were explored.

Practice was investigated with a question on the *frequency of plant protein consumption,* "How often do you eat the following foods at home or outside home?" followed with a list of pulses: "Peas (e.g. frozen peas, pea soup)", "Fresh or frozen green beans", "Dried or canned beans (e.g. chickpeas, brown beans, kidney beans, broad beans)", "Lentils", "Tofu", "Soy milk", "Soy milk products (e.g. soy cream, yogurt, ice-cream)", or Other soy products (e.g. soy chunks, textured soy protein, soy sausages)", each with the options "never", "less often than once a year", "a few times a year", "about once a month", "2 or 3 times a month" and "at least once a week". In the final analysis for the consumption of dried/canned beans, it was not feasible to use the category with the most frequent use as the outcome variable since it included only 6% of the respondents. Hence, for the regression analysis, the last two categories were defined as frequent use of beans.

Future practices were measured with the question "Please estimate whether you are going to make changes in the consumption of the foods presented below within the following 2–3 years", followed by foods including "beans (e.g., brown, broad beans)", with the options "I have not used and will not use in the future", "my consumption will decrease", "my consumption will remain the same" and "my consumption will increase". Moreover, three statements measured the willingness to try new bean products: "I would like to try a 'yogurt' made of broad beans", "I would like to try an 'ice cream' made of broad beans" and "I would like to try a 'cheese' made of broad beans", each followed by the answering options "I totally disagree", "I somewhat disagree", "I neither disagree nor agree", "I somewhat agree", "I totally agree" and "I don't know". For the analysis, the "I somewhat agree" and "I totally agree" responses were combined as "I agree".

Competence was measured with the item "I don't know how to prepare dishes from dried beans", followed by the mentioned Likert scale. For the analysis, the "I don't know" response was combined with the "I neither disagree nor agree" response.

The *material and bodily* components were measured with the question "How probable is it that the following changes would increase your consumption of beans (e.g., brown beans, broad beans, lentils) or bean meals?", followed by the statements " . . . if beans were available as ready-meals in grocery stores", " . . . if the workplace canteen offered bean meals", " . . . if the supply of beans in grocery stores were more diverse", " . . . if I knew more bean recipes" and " . . . if I knew more bean varieties", with the response options "Would definitively not increase", "Would probably not increase", "I don't know", "Would quite probably increase", and "Would definitively increase". In the analysis the last two options were combined as "Would increase". The *bodily consequences* was measured with one item, "Beans give me stomach pain", followed by the above mentioned Likert scale. For the analysis, the "I don't know" response was combined with the "I neither disagree nor agree" response.

Meanings and images were measured in several aspects: *Environmental friendliness* was measured with two items: "Beans are a more environmental friendly option than meat" and "Substituting beans for meat slows down climate change", of which a sum score was formed (Cronbach's $\alpha = 0.832$). *Cultural acceptability* of beans was measured with four items: "Beans do not fit in with the Finnish food culture" (reversed), "Beans are good for everyday meals", "Meat is replaceable by beans and lentils", and "One can make a delicious festive meal out of beans" of which a sum score was formed (Cronbach's $\alpha = 0.797$). These items of competence, physical discomfort, environmental friendliness and cultural acceptability were followed by the mentioned Likert scale. For the analysis, the "I don't know" response was combined with the "I neither disagree nor agree" response. The items for assessing *the taste* of beans and *the perception of the healthiness* of beans were introduced by the

Table 1
Frequency of consumption of plant proteins at home or outside home, percentage of respondents (n = 1084).

	Never	Less than once a year	A few times a year	Once a month	Two or three times a month	At least once a week	Total
Peas (e.g. frozen, pea soup)	3	5	34	27	24	7	100
Fresh or frozen green beans	14	15	35	18	14	4	100
Dried or canned beans (e.g. chickbeans, brown, kidney beans, broad beans)	22	18	28	14	12	6	100
Lentils	37	24	22	7	7	3	100
Tofu	50	25	15	3	4	3	100
Soy milk	68	16	8	3	2	3	100
Soy milk products (e.g. soy cream, yogurt, ice-cream)	58	19	14	4	3	2	100
Other soy products (e.g. soy chunks, textured soy protein, soy sausages)	56	18	13	4	5	4	100

"Eating of beans is in my opinion . . . " question and the answers were given on a seven-point rating scale from 1 to 7 ("Unhealthy-Healthy"; "Unpalatable-Palatable").

In the analysis, SPSS version 21 was applied. The associations between current bean consumption and future intentions are presented with cross tabulations (Chi-square test). The associations between the socioeconomic factors, competence and perceptions of bean eating were investigated using Pearson correlation coefficients, and in the final analysis with logistic regression analysis.

In the discussion, we explore the alternative developments of plant protein consumption and how they relate to our results as regards plant protein related meanings, competence and materialities. This exploration is inspired by STEEPV analysis, used previously, e.g., in the analysis of the future of meat consumption (Vinnari, 2008) and in corporate foresight (Hammoud & Nash, 2014). STEEPV builds the scenarios as regards changes in social, technological, economic, ecological, political and in value environment. We combined the basic concepts of STEEPV with concepts of practice theory, i.e., meanings, competence and materialities that are key elements in the formation of new practices (Shove et al., 2012). We explore a scenario in which the consumption of plant proteins increase and a scenario in which the consumption decreases or remains stable. For both scenarios, we include driving factors for change and resulting change in meanings, competence and materialities as well as actors that have a central role in the change.

3. Results

Peas were the most frequently used plant protein, and tofu and soy products were the least frequently used plant protein (Table 1). A half of the respondents never ate tofu and more than a half never consumed soy milk, soy milk products or other soy products. All plant protein foods were consumed more frequently among vegetarians compared to non-vegetarians. Dried/canned beans were, for example, consumed at least once a week by 39%, and 2–3 times a month by 24% of the vegetarians, compared to 4% and 11% of the non-vegetarians, respectively ($p < 0.0001$). Tofu was consumed at least once a week by 27%, and 2–3 times a month by 25% of the vegetarians, and by 1% and 3% of the non-vegetarians, respectively ($p < 0.0001$). Soy chunks, textured soy proteins and soy sausages were consumed at least once a week by 37% and 2–3 times a month by 27% of the vegetarians, and by 2% and 3% of the non-vegetarians, respectively ($p < 0.0001$).

We chose one plant protein source, dried/canned beans, for further analysis. They were consumed less frequently than peas and slightly less frequently than green beans, but more frequently than lentils and especially tofu and other soy products. In total, 20% of the respondents intended to increase their bean consumption in the future (Table 2). The more frequent the current bean consumption, the more often the respondent reported intention to increase the consumption. Only a minority of those who did not consume beans at all or ate them a few times a year had intentions to increase the consumption in the future.

In total 33% of the respondents were willing to try 'cheese' made of broad beans. The corresponding figures for 'ice-cream' and 'yogurt' were 28% and 28%, and the willingness was more common among those who currently ate beans frequently compared to the never-users or infrequent users (Table 3). Knowing more bean recipes and bean varieties, and the supply of bean meals at workplace canteens were the most frequently mentioned prerequisites for increase of bean consumption. All the prerequisites were most frequently reported by those consuming beans at least once a week and the least often by those who never ate beans.

Frequent consumers of dried/canned beans also ate other plant proteins frequently: 56% ate peas, 47% green beans, 49% lentils, 34% tofu, and 31% other soy products (soy chunks etc.) at least 2–3 times a month (data not shown).

The correlations between the independent variables of the regression model were below 0.5, except between cultural acceptability and environmental friendliness (0.550) and cultural acceptability and taste (0.631). In the adjusted model there were no gender differences in bean consumption (Table 4). The 25–44-year-old respondents and those living in the Uusimaa district and the capital area consumed beans more frequently than the other groups. Respondents with a university degree were the most likely to be frequent consumers of beans, and those with comprehensive or vocational school education the

Table 2
Percentage of those intending to increase, decrease or not change their bean consumption within the next 2–3 years among different categories of bean consumers (n = 1048).

Future consumption	*Current consumption of dried/canned beans*						
	Never	Less than once a year	A few times a year	Once a month	2-3 times a month	At least once a week	All
Within the next 2–3 years							
I have not consumed and will not consume	72	37	12	2	0	0	26
My consumption will decrease	2	3	1	1	2	0	2
My consumption will remain the same	21	46	68	68	66	52	52
My consumption will increase	5	14	19	29	32	48	20
Total	100	100	100	100	100	100	100
(N)	(230)	(189)	(294)	(147)	(125)	(63)	(1048)
$p < 0.0001$							

Table 3
Percentage of those willing to try out new broad bean products and willing to eat more beans due to various reasons, among different categories of bean consumers (n = 1048).

	Current consumption of dried/canned beans						
Willingness to experiment and prerequisites for increase	Never	Less than once a year	A few times a year	Once a month	2–3 times a month	At least once a week	All
I would like to							
. . . try 'cheese' made of broad beans $p < 0.0001$	13	28	37	43	40	73	33
. . . try 'yogurt' made of broad beans $p < 0.0001$	10	20	30	42	35	70	28
. . . try 'ice cream' made of broad beans $p < 0.0001$	11	21	31	39	31	68	28
I would eat more beans							
. . . if beans were available as ready-meals in grocery stores $p = 0.002$	12	15	23	19	22	32	19
. . . if the workplace canteen supplied bean meals $p < 0.0001$	19	35	47	59	58	70	43
. . . if the supply of beans in grocery stores were more diverse $p < 0.0001$	15	24	33	48	44	62	33
. . . if I knew more bean recipes $p < 0.0001$	32	54	60	62	62	65	54
. . . if I knew more bean varieties $p < 0.0001$	26	46	51	52	48	59	44

least likely. As expected, being a vegetarian increased the probability of eating beans frequently. While all the variables in the model had an independent association with frequent bean consumption, many of the associations did not hold in the adjusted model. Holding a view that beans are suitable for the current food and meal culture, competence to prepare bean meals and considering beans as tasty increased the likelihood of frequent bean consumption, whereas perceptions of beans causing stomach pain and that beans are good for the health or environment were not associated with bean consumption. When the model was conducted only among the non-vegetarians the associations remained the same (data not shown).

4. Discussion

The study showed that plant protein sources used typically as meat-substitutes – beans, lentils, tofu and other soy products – are infrequently consumed among Finns. Plant proteins that are typically used as side dishes to meat – green beans and especially peas – are eaten more frequently, but not on a weekly basis. As expected, all the studied plant proteins were consumed more often among vegetarians compared to non-vegetarians. Moreover, the consumption of plant proteins seems to cumulate, as frequent bean consumers ate other plant protein sources frequently, too.

Current practices were found to be associated with future intentions. A fifth of the respondents intended to increase their bean consumption within the next 2–3 years, the intention being the greatest among those who already included beans in their diet. Likewise, willingness to try new broad bean products was the greatest among those who used beans frequently. The frequent consumers also reported more often than the others that they would increase their bean consumption if the supply of beans and bean meals were better and if they knew more bean varieties and recipes. Hence, those who do not currently consume beans are the greatest challenge for the marketing and implementation of food recommendations, as they are neither familiar with beans nor willing to experiment with beans, nor do they consider a better supply or knowledge as a sufficient push to increase consumption.

In the logistic regression analysis, bean consumption was most strongly associated with vegetarianism, education, age, and geographical area. Associations with vegetarianism were expected, as vegetarians do not consume animal proteins. Association with socioeconomic factors are in line with results from Canada, the UK and the Netherlands, which have shown that those who are younger or have a higher level of education consume plant proteins more often than other population groups (Hoek et al., 2011; IPSOS, 2010). A previous study also reported differences between different areas of Finland, as fruit, berries and fresh vegetables were consumed more often among men living in Southern Finland compared to those living in Northern and Eastern Finland (Absetz et al., 2010). However, the result that gender was not associated with frequent bean consumption was somewhat surprising, given that women typically eat more "greens", such as vegetables, fruit and berries (Wardle et al., 2004; Lallukka, Laaksonen, Rahkonen, Roos, & Lahelma, 2007).

In addition to socioeconomic differences, bean consumption was associated with perceptions of the suitability of beans in the current food culture, competence to prepare bean meals and the perception that beans taste good. Moreover, the suitability of beans in food culture correlated with perceptions of the environmental friendliness and taste of beans. Others, too, have reported that lack of knowledge on how to cook pulse dishes (IPSOS, 2010; Wenrich & Cason, 2004) and not liking pulses (IPSOS, 2010; Schyver & Smith, 2005; Wenrich & Cason, 2004) are central reasons for not eating pulses. It might be

Table 4
Eating of beans at least 2–3 times a month by independent background variables and bean-related meanings, perceptions, and competence, unadjusted main effects and adjusted models (Odds Ratios from the Logistic Regression Analysis) (n = 1048).

	n	Unadjusted main effect		Adjusted model	
		OR, sig.	(95% CI)	OR, sig.	(95% CI)
Gender					
Male	433	1		1	
Female	605	1.44*	(1.04–2.01)	0.83	(0.52–1.27)
Age group					
15–24 years	200	1		1	
25–34 years	225	2.31**	(1.43–3.73)	2.35**	(1.21–4.57)
35–44 years	177	1.49	(0.88–2.52)	1.56	(0.75–3.23)
45–54 years	220	0.80	(0.46–1.38)	0.851	(0.40–1.81)
55–64 years	226	0.65	(0.37–1.15)	1.071	(0.50–2.29)
Area					
Uusimaa district (incl. capital area)	305	1		1	
Western Finland	203	0.47***	(0.30–0.75)	0.76	(0.43–1.35)
Central, South-Eastern Finland	341	0.43***	(0.29–0.64)	0.52*	(0.32–0.86)
Northern, North-Eastern Finland	199	0.38***	(0.23–0.62)	0.51*	(0.28–0.92)
Education					
Comprehensive school, vocational school	279	1		1	
Secondary graduate school	170	2.99***	(1.70–5.25)	2.59**	(1.27–5.30)
Polytechnic or bachelor degree	375	2.47***	(1.49–4.07)	2.40**	(1.30–4.43)
University degree	224	4.17***	(2.48–6.99)	3.25***	(1.69–6.24)
Vegan or vegetarian					
No	977	1		1	
Yes	71	10.09***	(6.04–16.88)	3.56***	(1.77–7.18)
Stomach pain Continuous (range 1–5)	1048	0.64***	(0.55–0.73)	0.909	(0.76–1.08)
Competence to prepare bean dishes Continuous (range 1–5)	1048	1.94***	(1.71–2.20)	1.40***	(1.20–1.64)
Beans suitable for everyday & festive meals Continuous (range 1–5)	1048	4.24***	(3.35–5.35)	1.79**	(1.27–2.54)
Environmental friendliness of beans Continuous (range 1–5)	1048	3.81***	(2.64–5.50)	0.84	(0.52–1.36)
Healthiness of beans Continuous (range 1–7)	1048	2.02***	(1.71–2.38)	1.08	(0.88–1.33)
Tastiness of beans Continuous (range 1–7)	1048	2.44***	(2.10–2.83)	1.59***	(1.31–1.92)

Nagelkerke R Square 0.44.
* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

that taste and positive image are tied together in forming the practice of bean eating (Shove et al., 2012). In the present study, however, perceptions that beans are beneficial for health and environment were not enough to cause frequent bean consumption.

To summarize, bean consumption was more typical among the educated respondents, among 25–34-year-olds and in the districts in and around Helsinki as well as among those respondents who knew how to prepare dishes from dried beans and considered that beans taste good and are culturally suitable. It might be that these socioeconomic groups are the first who have adopted beans as a potential component of their overall diet. However, the trend might go in the other direction as well: in Mediterranean cultures where beans have traditionally been a major part of the mainstream food culture, fast food might be currently replacing pulses by representing something cool and dynamic, whereas pulses are seen as "the antithesis of [cool practices]" among young people (Ioannou, 2009).

It is typical that new foods – for example healthy or otherwise distinctive foods – are first adopted by the highly educated or the middle class (Warde, 1997). Liking of foods is partly formed by an environment where certain foods are appreciated and liked and others are not (Logue, 2004), and hence, cultural meanings of foods are central in practice formation. In the capital area, there are more ethnic restaurants introducing pulse dishes to the food culture, and the educated often have more experiences of different cuisines gained while travelling.

It is not only meanings and competences that have an impact of food choices but also the repeated consumption of certain foods affect perceptions of cultural suitability, other meanings and taste, and further reinforce competence to prepare meals. Shove (2010) suggests that perceptions and attitudes associated with behaviours should not be seen as preceding

Table 5
Two alternative developments of plant protein consumption, related changes in meanings, competences and materials/infrastructure and the actors responsible for the actions.

Driving factors for meanings and images	
Plant protein consumption will increase	Plant protein consumption will decrease or remain stable
– The harms, such as climate change effects, caused by meat production and consumption are increasingly discussed in society and people become more knowledgeable about them	– The debate over a change towards more sustainable eating is neglegted
Politicians, research and development institutes, universities, think tanks, NGOs, media	
– Vegetable proteins are promoted in the media as a palatable alternative	–Vegetable proteins are not promoted in the media as a palatable alternative for meat
Journalists, editors-in-chief, producers of food related television programmes, bloggers	
– Home economics education at schools will promote a positive image of plant protein meals	–Home economics education at schools promote meat and fish as the main valued component of meals; vegetarian dishes remain marginal
Planners of school curriculum, teachers	
–Celebrity chefs, food journalists and bloggers will develop and promote recipes from plant proteins both for everyday and festive meals	–Celebrity chefs, food journalists and bloggers keep meat and fish as the centre of meals
Chefs, bloggers, producers of food related television programmes	
– Workplace and school canteens and restaurants advance the use of vegetarian dishes as the 'default' option	– Canteens at workplaces and schools and restaurants remain reluctant to advance vegetarian dishes
Planners of workplace and school menus, restaurant managers	
Resulting changein meanings and images	
- The cultural image of meat deteriorates: meat is considered unethical, unsustainable and/or unhealthy. –The cultural image of plant proteins improves: plant proteins are considered ethical, sustainable and healthy.	–Meat remains the highly valued centre of the meal –Plant proteins are considered a dull and untasty substitute of meat, not a valuable centre of a meal as such –Vegetarianism and flexitarianism remain marginalised
Driving factors for competence	
Plant protein consumption will increase	Plant protein consumption will decrease or remain stable
–Home economics education will change towards treating plant proteins as the centre of the meal and include recipes from plant proteins both for everyday and festive meals	–Home economics education does not actively promote or include recipes from plant proteins
Planners of school curriculum, teachers	
–Celebrity chefs, culinary magazines, bloggers and food 'intermediaries' promote easy dishes where plant proteins are central	–Celebrity chefs, culinary magazines, bloggers and other 'intermediaries' only or mainly promote dishes based on animal protein
Chefs, bloggers, journalists, editors-in-chief	
Resulting competence	
–Consumers and food professionals are better skilled and enthusiastic in using plant proteins	–Consumers and food professionals remain unskilled in cooking and unaccustomed to eating plant proteins
Driving factors for materials and infrastructure	
Plant protein consumption will increase	Plant protein consumption will decrease or remain stable
– Novel plant protein products are developed and marketed, the supply of plant protein products is wide	–Novel plant protein products are not developed and old products are not marketed and the supply is limited
Agriculture, food producers, food industry, retailers	
– Public and private catering replace animal proteins with plant proteins	– Restaurants and the catering sector remains inactive in offering dishes based on vegetable proteins
Public and private catering, restaurants	
–Ready-made meals from plant proteins are palatable, affordable and widely distributed	–Ready-made meals are mainly made of meat or fish, vegetable-based ready meals are expensive, unattractive or unpalatable
Food industry, retailers	
–Restaurants increase meals from plant-protein in their menus	–Restaurant include only a few plant protein meals or reduce their number
Restaurants, restaurant managers, chefs	

Table 5 (*Continued*)

Driving factors for materials and infrastructure	
Plant protein consumption will increase	Plant protein consumption will decrease or remain stable
– Plant proteins are promoted in political strategies and action programmes	–Plant proteins are not included in political strategies and actions programmes
Politicians, ministries and authorities, central research and development institutes, think tanks, NGOs	
–Price of meat increases either via taxation or increased costs of production	–Price of meat remains affordable and competitive compared to price of plant proteins
Politicians, various actors in food chain	
Resulting change of materials and infrastructure	
–Food environments are increasingly based on plant proteins and decreasingly on animal proteins	–Food environments are based on the already large and increasing use of animal proteins –Vegetable proteins remain marginal in policies, agriculture, food industry, retail and consumption

consumption but as a part of the same existence and potentially changed through the ongoing reproduction of a social practice. Michie, Hyder, Walia and West (2010) too, claim that behaviours in turn influence capability, opportunity and motivation. Conversely, negative meanings foster non-consumption and vice versa.

Moreover, food technologies, advertisement, gourmet cultures and magazines are constantly defining what to expect from meals and what is appropriate in different situations. Opinions about beans and tofu eating are not just personal opinions, but instead associated with larger systems of practices – such as meat eating, fast food industry, supermarketization or the agri-food business (Warde, 1997), i.e., bundles or complexes of practice (Shove et al., 2012).

Based on practice theoretical analysis (Shove et al., 2012) and our results, we propose two alternative future developments for change and actors responsible for actions as regards images, competences and materialities related to plant proteins (Table 5). Likewise, frameworks for sustainable food systems include diverse actions, such as higher VAT on meat and dairy products and CO_2 taxes, introducing production quotas for meat and other animal products, awareness campaigns on food waste and stimulation of retailers to develop sustainable food strategies (Reisch, Eberle, & Lorek, 2013).

The data were collected by means of a web-based questionnaire. With the low response rate, it might be that those who are the least interested in plant proteins did not respond. Moreover, low response rate may be partly explained by the ease of ignoring e-mail invitations to participate. However, there are indicators showing that the current data is not particularly biased towards groups favouring vegetarian diet and plant proteins: The proportion of self-reported vegetarians in the present study is only slightly higher compared to another recent study among Finns (Vinnari et al., 2008), indicating that at least as regards vegetarians the data are not particularly biased. Moreover, a survey targeted at vegetarians in the capital area shows considerably higher rates of plant protein consumption [Authors, unpublished results] compared to the low percentages among the mostly non-vegetarian population of the present study. The fact that a great majority of the age groups studied here have access to Internet at home supports the data collection method, although those with low level of education and living outside capital region were under-represented. Hence, it may be concluded that the data still covers population groups with lowest response rate.

Web-based surveys have many advantages as they have low cost, speed and precision of data collection. Moreover, they are less prone to social desirability bias than other methods of data collection, their subjects are comparable to those responding to traditional modes of data collection (van Gelder, Bretveld, & Roeleveld, 2010), and low response rate does not necessarily compromise the accuracy of the data in respect of most political, social and economic measures (Kohut, Keeter, Doherty, Dimock, & Christian, 2012).

5. Conclusions

Currently, replacing at least a part of the meat in the diet with plant proteins is seen as beneficial for human health (Nordic Nutrition Recommendations, 2014; World Cancer Research Fund, 2013) and the environment (Virtanen et al., 2011). For many people, however, these attributes alone are not convincing enough. For bean and tofu eating to become routinised, new links are essential: plant proteins need to be associated with festive, fulfilling, energizing and pleasurable food, and not simply seen as odd or a forced choice of vegetarians or other sub-groups (Schyver & Smith, 2005). At the same time, old associations need to be challenged, so that meat and fish are not regarded as the only sources of festive, fulfilling and satisfying food. Moreover, new cooking skills need to be learned. This development has been termed as a sustainable culinary culture (Mäkelä & Niva, 2015).

According to practice theory, transitions towards sustainability do not depend on policy makers persuading individuals to make sacrifices (Shove, 2010). Schneider (2002) lists low level of innovation and marketing of pulse products, lack of attractive food products and the old-fashioned image of pulses as limiting pulse consumption in Europe. Hence, societal innovations are needed in order to change the prevailing practices, meanings and expectations across several domains of

daily life. This will be even more central with novel products such as algae and insects (Boland et al., 2013) that are not currently part of European diets.

de Boer (2006b) points out that it is important to "involve both mainstream and critical consumers in discussions on food production methods". It is probable that habits first adopted by some social groups are later adopted by other groups, too. The question is, to what extent is it possible to accelerate the process of turning plant proteins into a normal component of Finnish diets and meals and, finally, to be frequently consumed? Several researchers are rather sceptical about voluntary replacement of meat with plant proteins in the future (Smil, 2002), unless appropriate interventions are developed and tailored differently for different target groups (Vinnari, 2008; Vinnari & Tapio, 2009). There are experiences that strict vegetarian days at schools have met with non-compliance (Lombardini & Lankoski, 2013) and been widely criticised in the media. However, active familiarization and positive image development (Vinnari, 2008) might gradually help by, e.g., keeping bean, tofu and other soy-based dishes systematically on the menus of school and workplace canteens and lunch cafeterias and bistros. In these contexts, seeing peers eat plant protein-based meals might familiarize these meals among those who are reluctant to eat vegetable dishes.

A feasible option might be a perspective promoting flexitarianism, i.e., a transition towards a food culture where the consumption of meat is actively cut down by replacing a part of meat proteins, such as ground beef, with plant proteins (Smil, 2002). This kind of a change in which meat eating and vegetarianism are not seen as opposites but as a continuum would perhaps allow for the development of a more casual and relaxed attitude towards plant protein eating, which might in the end become a routinised and embodied practice of everyday life.

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